

greatest, and junior personnel to tasks in which their disadvantages are least. Most corrosion control work, for example, would be performed by those who have just completed their school training, and most periodic inspection by seasoned career personnel.

This study mirrored the task assignment process that would take place in a work center through the techniques of linear programming. The goal was to accomplish the required amount of work on each task while minimizing the total number of personnel required, subject to a number of constraints. The constraints reflected practical considerations that would prevent the achievement of the most efficient short-run solution, such as the need to provide junior people with the opportunity to gain experience in the more complex tasks. An additional constraint ensured that the mix of personnel by labor type would be the same as that found in the work centers when the data were collected.

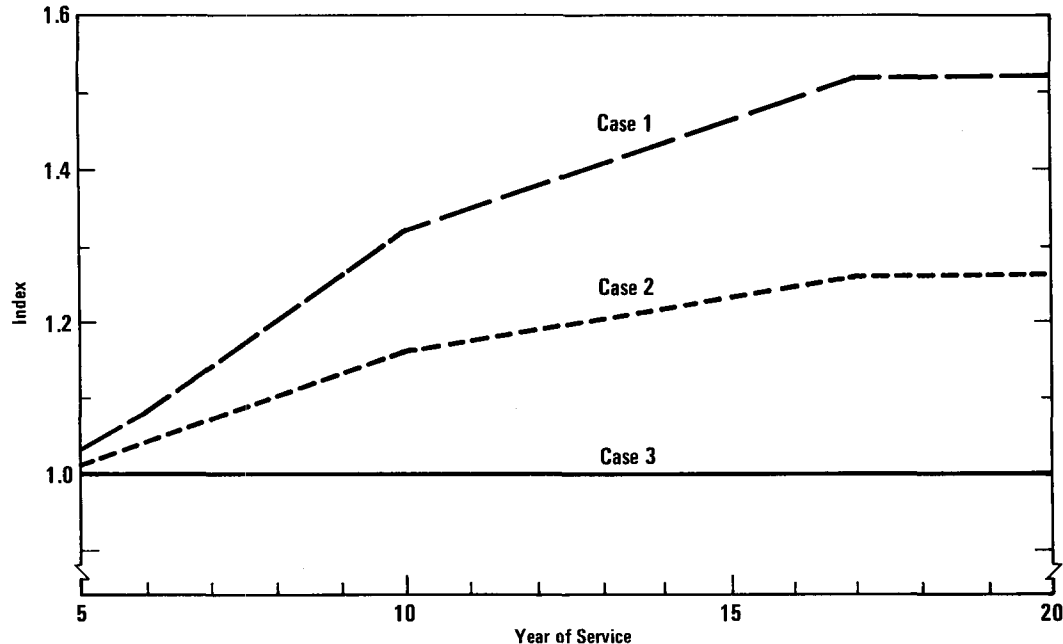
The linear programming procedure provided measures of the relative marginal productivities of personnel in the various labor types. With these values assigned to the average time in service for the labor types, linear interpolation yielded the required index of productivity at each year of service.

Because the constraints imposed in the linear program affected the results, and because choosing an appropriate set of constraints involved some judgment, two alternative indexes were developed. One of these, denoted "Case 1," reflected an attempt to match the set of constraints identified in the original study. The second, "Case 2," simply halved the improvement at each year of service over the reference point, the end of the fourth year, to illustrate the effects of assuming lesser effects of experience on productivity. Case 2 also approximated the results under an alternative set of constraints that also appeared to be plausible. A final index, "Case 3," arbitrarily held productivity constant at its value for the end of the fourth year of service, thus assuming no relationship between experience and productivity beyond the first term.

Figure 6 displays the three productivity indexes. The line for Case 1 shows the most senior personnel as being roughly 52 percent more productive than the reference person, the same journeyman as used in the EUS. This is a smaller return to experience than was estimated in a previous CBO study, based on earnings growth in the private sector (see the discussion in Chapter I). ^{14/} Also, the data can support even higher estimates of the

14. Congressional Budget Office, *Quality Soldiers: Costs of Manning the Active Army* (June 1986).

Figure 6.
Productivity Indexes by Year of Service



SOURCE: Congressional Budget Office.

NOTE: Productivity is measured relative to that of a typical enlistee who has completed four years of service.

return to experience. ^{15/} Thus, Case 1 represents not an upper bound, but rather a judgment as to the most likely relationship between productivity and experience in military jobs.

Case 2 represents a very conservative interpretation of the same results, conservative in the sense that it tends to minimize the estimated productivity gains that more senior forces will generate. Conservatism may be appropriate when these results, derived from data on a single Air Force specialty, are to be applied to all four services. Case 3 was added as an additional test of sensitivity. It might be taken as reflecting the agnostic position that the data are too limited to permit any conclusions to be drawn.

The three alternative indexes for years-of-service five and beyond were linked to the four service-specific indexes for years one through four

15. If no constraints are imposed on the task assignments of personnel at different skill levels, the trade-off between senior and junior personnel--roughly an 82 percent advantage of the most senior over someone with four years of service--approaches that on the task with the greatest difference in performance times.

described in the previous section. This resulted in three indexes for each service, reflecting the three alternative cases for the period after the first term.

PROJECTIONS OF AGGREGATE PRODUCTIVITY

All four services should show increased aggregate productivity in their enlisted forces by the early 1990s, even if productivity growth beyond the first term is small (Case 2) or nonexistent (Case 3). Figure 7 shows projections of productivity per person in the enlisted forces of each of the services, measured as percentage changes relative to 1985. The projections result from the mechanical application of the indexes described above to the year-of-service projections summarized in Figure 2 (Chapter II); the final section of this chapter discusses the limitations of this approach.

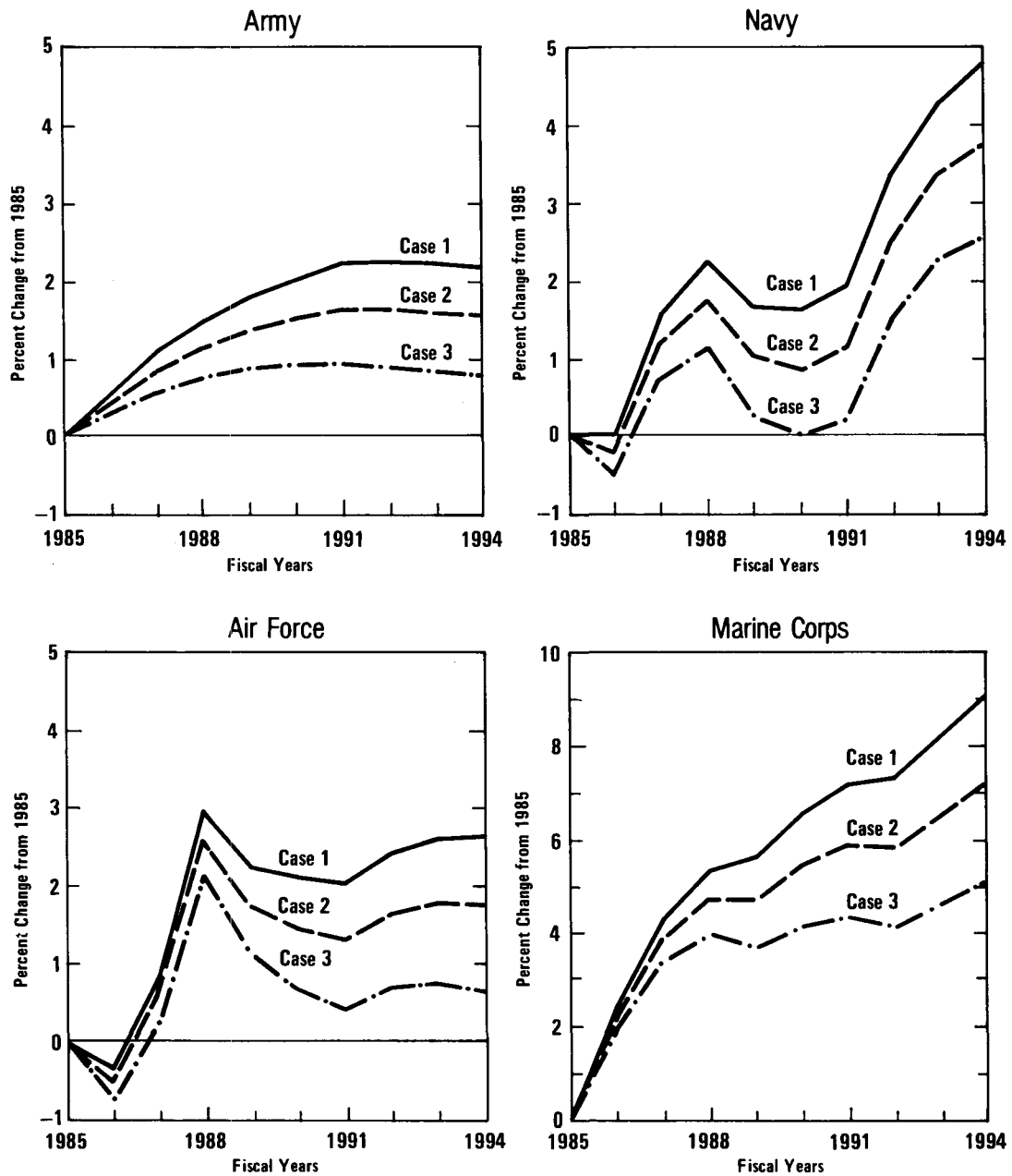
The largest productivity gains should be experienced by the Marine Corps. In 1992, the greater experience of the average Marine will make that person 7.4 percent more productive than his counterpart in 1985 and 2.9 percent more productive than in 1987 (Case 1). Under the more severe assumption of Case 3--no productivity growth beyond the first term--the gains will be more modest: 4.1 percent relative to 1985 and 0.7 percent relative to 1987. The Marine Corps gains are largest primarily because this study projects that it will undergo the most severe shift in its experience structure, with senior personnel in effect replacing first-termers.

Navy productivity gains probably would equal those of the Marine Corps were it not for the Navy's recent strength increases and its plans for additional increases in the future. The high accession levels needed (under the assumptions of this study) to support these strength increases tend to depress average productivity. After the planned growth is completed in 1991, Navy productivity should rise rapidly.

The Air Force projections for 1988 show an effect opposite to that observed for the Navy. The Air Force plans to cut strength by 8,000 in 1988. This should reduce its requirement for new recruits by about 10 percent relative to 1987, and so result in a temporary jump in average productivity.

Table 6 may help put the productivity gains in perspective, comparing the 1992 gains, relative to 1987, with the costs of the increased seniority that provides the gains. In 1992, personnel costs would be at least \$420 million higher for the services combined--up to \$720 million if promotion

Figure 7.
Projections of Average Productivity in the Enlisted Force of Each Service



SOURCE: Congressional Budget Office.

rates and timings did not change--than they would be if the year-of-service structures were the same then as in 1987. Excluding any effects of richer grade mixes, the cost increases should range from 0.5 percent for the Air Force to 1.7 percent for the Marine Corps. Productivity would grow twice as fast as costs under Case 1, and slightly faster than costs under Case 2. Only under the extreme assumption that senior career personnel are no more productive than someone just finishing the fourth year of service (Case 3) would the percentage cost increases exceed the percentage productivity gains. If projected changes in the grade mix are allowed to take place, however, costs could rise faster than productivity even under Case 1.

The returns to seniority growth can also be compared with total defense costs, of which the enlisted personnel costs examined in this study make up only about one-sixth. The added costs in 1992--\$420 million to \$720 million--represent only 0.14 percent to 0.24 percent of the 1987 defense budget. Even under the least favorable case, percentage productivity improvements would be several times larger.

That the returns to greater seniority may exceed the costs, in percentage terms, has no particular significance in this military context; notions of cost-effectiveness are not applicable to situations in which the returns (in this case, productivity) cannot be measured in the same units as the costs.

TABLE 6. SENIORITY GROWTH COSTS AND PRODUCTIVITY IMPROVEMENTS: 1992 VERSUS 1987

Service	Cost Increases a/		Productivity Improvements (In percent)		
	In Millions of 1987 Dollars	In percent	Case 1	Case 2	Case 3
Army	120 - 210	0.6 - 1.1	1.2	0.8	0.4
Navy	150 - 220	1.0 - 1.5	1.8	1.3	0.8
Marine Corps	80 - 150	1.7 - 3.2	2.9	1.9	0.7
Air Force	80 - 140	0.5 - 1.0	1.6	1.1	0.4

SOURCE: Congressional Budget Office.

- a. Lower figures reflect seniority growth only, holding constant aggregate grade mixes; higher figures include projected increases in percentages of personnel in the senior pay grades.

What the results do indicate is that allowing the seniority growth probably would be a cheaper way of achieving small improvements in capabilities than, for example, adding 20,000 or 30,000 personnel to the enlisted forces while holding the year-of-service structures constant (assuming that were possible). Conversely, the results may be interpreted as suggesting that modest reductions in strength, relative to planned levels, would not reduce enlisted-force capabilities. This is the main subject of the final chapter of this paper. Before drawing firm conclusions, however, it is important to recognize the limitations of the underlying productivity data and their application.

LIMITATIONS AND QUALIFICATIONS

Five main factors limit the usefulness of the productivity indexes and the conclusions that may be drawn when they are applied to the enlisted force projections:

- o The data are very skimpy, especially beyond the first term.
- o The data, particularly those from the EUS, are now rather old; relationships that held in 1975 may no longer apply because of changes since then both in the quality of recruits and in the nature of the work they are asked to do.
- o The indexes were derived from specialty-specific data, and so may not be entirely appropriate for application to an entire service.
- o Relative productivity estimates are technically applicable only to experience mixes that are close to those from which they were estimated.
- o Feasible productivity trade-offs may be limited by factors not considered here, such as manning requirements that are fixed because of past decisions on hardware designs, the small numbers of personnel in some work centers, and the inability of current military manpower systems to respond promptly and efficiently to changes in experience levels.

These factors are discussed in turn below. A concluding paragraph summarizes the discussion.

Skimpy Data

Results for one Air Force specialty hardly provide a sound basis for generalizations about aggregate productivity in each of the services. Clearly, more data on productivity growth beyond the first term are required. Nonetheless, the Air Force data are at least drawn from a military source rather than from the private sector, and the specialty examined is probably near the middle of the complexity spectrum among military jobs, not at one of the extremes. The clear indication in the data that productivity improves with experience suggests that the Case 3 indexes, although useful in measuring the sensitivity of results, do not represent the general situation in the military.

The more comprehensive EUS data would seem to be an adequate source of information on productivity growth during the first term. Additional data would be desirable, of course, especially if they were based on some objective output measure such as was available in the study of system downtimes on Navy ships. Further analysis of the EUS data would also be useful to answer more detailed questions, such as whether productivity on the job improves at different rates for recruits with different aptitudes and education.

Old Data

The time that has passed since the EUS data were collected in 1975 raises questions about their applicability to the forces of the 1980s and the 1990s. This is especially true for the Army, in which two conflicting effects have been felt. On the one hand, Army recruits in the mid-1980s have been, by any measure, better than their counterparts of a decade earlier; a much higher percentage now enter with high school diplomas, for example, and average scores on the aptitude tests administered to recruits have been higher. Evidence on the relationship between aptitude and first-term performance is not conclusive, but it seems likely that the average recruit of the 1980s can perform a given job better than his or her counterpart in the 1970s. ^{16/} On the other hand, Army jobs apparently have become more

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16. Two studies indicating that higher-scoring recruits perform better are: Richard L. Fernandez and Jeffery B. Garfinkle, *Setting Enlistment Standards and Matching Recruits to Jobs Using Job Performance Criteria* (Santa Monica, Calif.: The RAND Corporation, R-3067-MIL, January 1985); and Barry L. Scribner and others, "Are Smart Tankers Better? AFQT and Military Productivity," *Armed Forces and Society*, vol. 12 (Winter 1986), pp. 193-206. Neither study found a strong time-in-service effect, but for the former this may have been due to problems in the performance measure. The "Tankers" study examined only a single occupational specialty. In Michael P. Ward and Hong W. Tan, *The Retention of High Quality Personnel in the U.S. Armed Forces* (Santa Monica, Calif.: The RAND Corporation, R-3117-MIL, February 1985), the effect of aptitude test scores
- (Footnote Continued)

complex, which presumably would slow recruits' attainment of full proficiency. ^{17/} It is impossible to know which of these effects has been stronger.

Applying Specialty-Specific Results to an Entire Service

Two main problems arise when results for one or more specialties are applied to an entire service (aside from the obvious possibility that the specialties may not be sufficiently representative). The first--that experience in the current job is not the same thing as years of service--should not affect the results of this study. The second is more important: the performance of a unit--a battalion, a ship, or even a personnel records office--may not be determined solely by the productivities of the individuals in the unit.

Specialty changes are a common feature of military service because jobs differ in their retention patterns and in their needs for senior personnel. Naturally, members who change jobs will tend to be less productive initially in their new skill than they were in their old one, other things being equal. As a result, any index of productivity by experience level for a particular specialty that was based on years in that specialty would tend to overstate the returns to total service experience.

Fortunately, the data underlying the productivity indexes beyond the first term measured total service experience. ^{18/} Although the focus of the analysis was a job-specific experience measure, the study made for the Air Force reported average years of service for the individuals in each labor type. The years of service of members who had retrained--perhaps at their first or second reenlistments--were averaged together with the years for those who had never changed specialty. Thus, the productivity indexes reflect the pattern of specialty changes that led to the specific work force that was analyzed. To the extent that retraining into the specialty examined is not typical, of course, the indexes will be flawed, but that is just part of the general issue of how representative the specific skills are of the entire force, which is discussed above.

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16. on performance was negligible when speed of promotion was used as the performance measure and as a control for unobservable "quality." A summary of service efforts to measure on-the-job performance is available in: Office of the Assistant Secretary of Defense (Manpower, Installations, and Logistics), *Joint-Service Efforts to Link Enlistment Standards to Job Performance*, Third Annual Report to the House Committee on Appropriations (December 1984).
 17. Martin Binkin, *Military Technology and Defense Manpower* (Washington, D.C.: Brookings Institution, 1986).
 18. Although the experience measure in the EUS data was job-specific, specialty changes are not important enough during the first enlistment term for this to create a problem.

The second problem arises because few if any military units consist of individuals working independently on their separate tasks. Most work is cooperative, with the skills of one person complementing those of coworkers (or fellow crew members, squad mates, and so forth). In this context, averaging the productivity improvements arising from individual experience gains may not yield an accurate measure of capability improvement for the unit. Unit performance may be determined more by the weakest link--the inexperienced tank driver, for example, whose erratic movements offset any advantage of experience in the gunner's position. At a larger level, the weak link could be a specialty in which experience yields few rewards, and whose members play a key role in the operation of a unit comprising personnel in many specialties. The converse is also possible, however: greater experience in a few key positions may dramatically improve a unit's performance. 19/

Considerations of unit versus individual performance suggest that analyses of unit performance would be more appropriate sources of data for this study than the individual-performance analyses actually used. Unfortunately, usable examinations of unit performance are not available. 20/ Lacking them, this study implicitly assumed that the two tendencies described in the previous paragraph, to the extent they operate, exactly offset one another in determining the aggregate capabilities of the services' enlisted forces. 21/

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19. One study described the phenomenon thus: "For some interactive tasks, there is a 'bottleneck' effect, where performance is more determined by the least-able member, while for other tasks, there is an opposite effect, where the most-able member predominates and determines performance." See James P. Kahan and others, *Individual Characteristics and Unit Performance: A Review of Research and Methods* (Santa Monica, Calif.: The RAND Corporation, R-3194-MIL, February 1985), p. vi. The study distinguished "coactive" tasks, "in which group productivity is a function of separate, albeit coordinated, individual efforts" (p. v); and "interactive" environments requiring collaborative efforts. It concluded that individual abilities more strongly determine unit performance in coactive tasks than in interactive, and noted that interactive tasks predominate in the Army.
 20. The CNA analysis of ship condition, described above, did examine unit performance, but although it provides qualitative support for the main conclusions of this chapter the report on this work does not give useful quantitative results. The study also did not examine the contribution of the various systems aboard a ship to the ship's ability to fight.
 21. Interactions between officer and enlisted personnel undoubtedly are also important in determining a service's capabilities. This study ignores these interactions.

Relative Productivity Estimates and the Experience Mix

The analysis of the post-first-term data from the Air Force study highlights the dependence of relative productivity estimates on the particular experience mix available. A unit that was very lean in senior personnel would be forced to assign even complex tasks to inexperienced personnel. In such a unit, an additional experienced NCO might be able to replace two junior people by taking over tasks (such as periodic inspection--see Figure 5 above) in which completion times drop rapidly with experience. In a unit rich in experience, however, an added senior person would be forced to perform tasks that someone more junior could complete almost as quickly (corrosion control, for example).

Despite the substantial change in the enlisted experience mix of the Air Force that has occurred since 1979, when RAND conducted the study of AGE maintenance personnel, adjusting for that change had little effect on the productivity estimates derived from the data. ^{22/} Although this finding does not necessarily imply that relative productivities would not be affected by the seniority growth projected for the future, it does suggest that the effects should not be large.

Other Limiting Factors

A number of factors could limit the services' abilities to achieve all of the returns to more senior forces that are implied by the productivity indexes developed in this study. Some examples follow.

Hardware Dictates Numbers. In many military units the substitution of experience for numbers may be difficult, if not impossible. The maintenance platoon for a tank battalion probably could get along with fewer people if it was given more experienced personnel. An individual tank could not. The current main battle tank (the M-1 "Abrams") was designed around a crew of four; any smaller number would severely impair its ability to fight. Similar situations arise in other Army units, aboard Navy ships, and in the aircraft of all the services--indeed, in civilian factories as well. Past decisions about the design of machinery and other systems may fix absolutely the numbers of people needed to operate them.

The importance of hardware-dictated requirements can be overstated, at least in the long run. Although an individual tank may require four people regardless of their experience, greater experience throughout a tank battal-

22. Appendix B discusses the sensitivity test in greater detail.

ion might improve the battalion's performance enough to justify reducing the number of tanks in the unit. In addition, new tanks might be designed with more capable crews in mind. Ships would seem to be the epitome of long-lived hardware, but individual systems within a ship may be modernized many times during the ship's operational lifetime, allowing adjustments to be made for more capable crews. In short, the limitations imposed by past hardware decisions will tend to disappear with time, both because of new equipment and because organizational restructuring may prove appropriate.

Small Numbers. In an aircraft maintenance shop of fifty men and women, a 10 percent reduction means dropping five positions. For the three-person night shift, which is staffed in case repairs cannot wait until the morning, the 10 percent reduction probably means no decrease at all. Three people could be the minimum number needed to bring to the job all required skills, or to perform all the tasks likely to be required of them simultaneously.

To the extent that manpower requirements in work centers or other basic organizational units are dictated by sub-units of small size, the success of any attempt to substitute experience for numbers will be limited. This is not to say that there are no solutions to problems of this sort; two maintenance shops might be combined, for example. It does suggest, however, that the productivity indexes developed in this study may overstate the potential for exploiting productivity gains to reduce personnel strengths. The extent of this overstatement cannot be estimated without a much more detailed examination of requirements than was possible for this study.

Response of the Manpower System. The very phrase "manpower requirements" suggests a certain inflexibility of the services' manpower systems. ^{23/} Requirements are determined through a bottom-up process. At its base, work-center requirements describe the one best way to accomplish the required tasks. These are aggregated upward to specialtywide and ultimately servicewide requirements--in numbers and skill levels (or grades). Practical considerations--including supply constraints--may lead to modifications at various levels in the process, or to deviations between available inventories and stated requirements, but the process does not provide alternatives to the one best aggregate manning structure. ^{24/}

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23. The term "requirements" as used here blurs the formal distinction between requirements and authorizations.
 24. This broad outline focuses on one key aspect of the services' requirements determination processes. For a more complete description, see Department of Defense, *Manpower Requirements Report for Fiscal Year 1988*, Appendix D (February 1987). The General Accounting Office has assessed the rigor of various portions of the processes; a summary is provided in *DoD Manpower: Information on the Accuracy of Defense Manpower Requirements* (March 1986).

Because they do not identify alternative manning structures, the services' requirements systems cannot promptly identify personnel savings when more experienced NCOs are available, nor can they ensure the best use of greater experience. They can indicate changes in requirements after more experienced personnel are in place, but this can mean lags of several years because requirements are not reviewed frequently. These points are not intended as an indictment of the services' manpower requirements systems. Indeed, those systems appear to be more rigorously developed than is typical in the private sector. They are well suited to a situation in which enhancements in productivity come primarily from improvements in hardware; they do less well when the character of the manpower inputs changes.

The inflexibility of the services' manpower systems that derive from the requirements-determination process means that improvements in aggregate productivity may not come as quickly, or as completely, as this study's projections indicate. How important these effects will be is impossible to predict.

CONCLUSIONS

The data underlying this study's productivity indexes--the only information available--are limited, somewhat old, and not ideally suited to the task to which they have been applied. Considerations of these defects lead to no firm conclusions about whether the two main sets of productivity indexes, Case 1 and Case 2, overstate or understate the true aggregate returns to experience in the military. On balance, it appears that overstatement is more likely, at least for the Case 1 indexes. This conclusion is based primarily on the difficulty that the services' manpower systems might have in fully exploiting the potential gains from a more senior force, and on the problem of small numbers of personnel in some work centers. In combination with the earlier conclusion that Case 2 represents a very conservative interpretation of the available data, this suggests that it may be appropriate to take the Case 1 and Case 2 projections as upper and lower bounds, respectively, of future changes in aggregate productivities.

Clearly, the long list of limitations argues for more research. Most needed are studies examining the effects of experience beyond the first term of service. The limitations also suggest that one must be conservative in reaching any conclusions. This paper adheres to that philosophy by showing results under cases that assume little or no increase in productivity along with those that assume more substantial increases.

The list of limitations could also lead one to decide that no conclusions can be reached. The services seem to be planning, however, to accept substantial increases in experience that will add as much as \$720 million per year to their personnel costs by 1992. They apparently feel they have information regarding trade-offs between experience and productivity that enables them to make this decision. Thus it seems reasonable to review alternatives to their decision using the same information. This is done in the next chapter.



CHAPTER IV

AGGREGATE PRODUCTIVITY LEVELS AND ENLISTED STRENGTH PLANS

Personnel strength levels are convenient, but deceiving, indicators of military force capabilities. Chapter II showed that the enlisted forces of all four active services will likely undergo fundamental changes through the mid-1990s, becoming composed increasingly of senior, experienced personnel. These more experienced personnel will add significantly to personnel costs--at least \$420 million in 1992, relative to 1987, and as much as \$720 million if they are promoted at the same rates as in the 1980s. Added costs will be even greater in subsequent years. A focus on personnel strengths alone ignores these important changes.

Weighting personnel at different experience levels by their relative productivities, rather than simply adding up their numbers, yields an alternative measure of capability that attempts to capture the effects of projected seniority growth. Available data are not adequate to permit firm conclusions about the rate at which productivity grows with experience, or about how individual productivities affect unit capabilities. The data are sufficient, however, to yield useful indications.

If the services are not taking account of productivity gains, they may be overestimating their future needs for enlisted personnel. Put another way, if the Congress is satisfied that the capabilities of today's enlisted forces are adequate, given their sizes, it can reasonably consider strength reductions, or increases smaller than requested, as the enlisted forces become more experienced.

This chapter examines the magnitudes of strength reductions or smaller increases--and their associated cost savings--that could be made without sacrificing overall capabilities. The next section sets out the main assumptions behind this examination and describes the basic procedure followed. The section following shows the capability-adjusted strength levels and costs, which depend upon which set of productivity indexes (Case 1, 2, or 3) is used. The final section summarizes the principal findings of this study.

ASSUMPTIONS AND PROCEDURE

This study derived alternative strength profiles for each service that yield profiles of aggregate personnel productivity matching the planned strength profile for that service. The Army, for example, plans for essentially constant enlisted strength levels through 1992; the reduced strength levels shown in the next section would keep aggregate productivity in the Army constant at its 1987 level. The Navy plans to increase enlisted strength by 5.3 percent between 1987 and 1992; the alternative below would yield roughly a 5.3 percent increase in aggregate productivity. In these alternatives, projected experience growth provides the required capability levels despite reductions, or smaller-than-requested increases, in personnel strength levels.

Three key assumptions underlie this procedure:

- o The services' enlisted strength plans represent requirements for aggregate personnel capabilities.
- o Enlisted productivity levels in 1987 constitute valid base levels relative to which to fix capabilities into the future.
- o Experience can substitute for numbers.

The first assumption implies that the services do not take account of experience growth in setting enlisted strength requirements. Although this may seem rather extreme, the Defense Department's formal statement of manpower needs contains little indication to the contrary. ^{1/} Only the Navy expresses dissatisfaction with current experience levels or indicates that it plans to expand its career force significantly. ^{2/} The Army, in contrast, states: "The data ... indicate that the Army has a seasoned leadership cadre. No significant changes are projected." ^{3/} None of the service statements suggests that its strength request would be higher if seniority growth were not expected.

It should be noted that service strength plans have been sharply cut back in recent years. In 1984, for example, the Navy requested a 1986

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1. Department of Defense, *Manpower Requirements Report for Fiscal Year 1988* (February 1987).
 2. Ibid., p. IV-8, IV-9, IV-17.
 3. Ibid., p. III-13.

strength of 595,600; a year later, its request for 1986 was 586,300. Army requests were reduced by 3,000 between 1982 and 1987. Although reductions in planned forces, and transfers of missions to the reserve components, explain much of the strength cuts, it is possible that improved productivity has also figured in. If improved productivity has been important, however, the services have not shown its importance by providing specific examples of large reductions in personnel linked to changes in personnel productivity.

The second assumption arbitrarily fixes as the base the last year, at the time of this study, for which the Congress had approved a defense budget. As shown in Chapter II, experience levels in 1987 were substantially above those in 1985, the last year before cuts under the Balanced Budget Act of 1985 began affecting defense appropriations. Thus, 1987 is a very good year, by historical standards, for military personnel capabilities.

The final assumption--that experience can substitute for numbers--was implicit in the analysis of the previous chapter, but several of the limitations and qualifications listed at the end of the last chapter raise concerns about its validity. The question is not so much whether substitution is possible at all, however, as it is the extent to which such substitution can reduce total requirements. Thus, although the assumption probably is valid, it may be appropriate to rely on the range of results bounded by Cases 1 and 2.

ENLISTED STRENGTHS AND COSTS

The alternative strength profiles through 1994, some of which show substantial cuts, are described below. The corresponding cost estimates follow the discussion of strength levels; relative to service plans, possible savings exceed \$1 billion per year. Discussion of a potential side benefit--reduced accession requirements--concludes this section.

Productivity-Adjusted Alternatives for Enlisted Strengths

Limiting aggregate productivity increases to the percentage increases in planned strength levels could reduce the services' total 1992 enlisted strength below its level in 1987 (see Table 7). If experience adds considerably to productivity (Case 1), strength could be reduced by almost 30,000. More modest effects of experience on productivity (Case 2) would still justify a reduction of 12,000. Only in the unlikely event that an enlistee's experience beyond the first term adds nothing to his or her productivity (Case 3) would an increase in strength be necessary.

Personnel strength levels would drop even under the extreme assumption of Case 3 were it not for the Navy's current plan to increase its strength by 5.3 percent. Under Case 3, achieving a 5.3 percent gain in capability would require increasing Navy strength by 3.2 percent, less than planned but enough to outweigh the strength reductions in the other services.

TABLE 7. PERSONNEL STRENGTHS, PRESENT AND PLANNED, WITH ALTERNATIVES UNDER THREE PRODUCTIVITY CASES

	Army	Navy	Marine Corps	Air Force	Total
Enlisted Strengths (In thousands)					
1987	666	509	179	493	1,848
1992:					
Service Plan	667	536	183	486	1,871
Case 1	658	513	173	475	1,819
Case 2	662	518	176	480	1,836
Case 3	665	525	179	484	1,853
Percent Changes					
Relative to 1987:					
Service Plan	0.0	5.3	1.8	-1.4	1.3
Case 1	-1.3	0.8	-3.4	-3.6	-1.6
Case 2	-0.7	1.8	-1.7	-2.7	-0.7
Case 3	-0.2	3.2	0.0	-1.8	0.3
Relative to 1992 Service Plan:					
Case 1	-1.4	-4.3	-5.1	-2.3	-2.8
Case 2	-0.8	-3.4	-3.5	-1.3	-1.9
Case 3	-0.2	-2.1	-1.8	-0.5	-1.0

SOURCE: Department of Defense (1987 and service plans) and Congressional Budget Office.

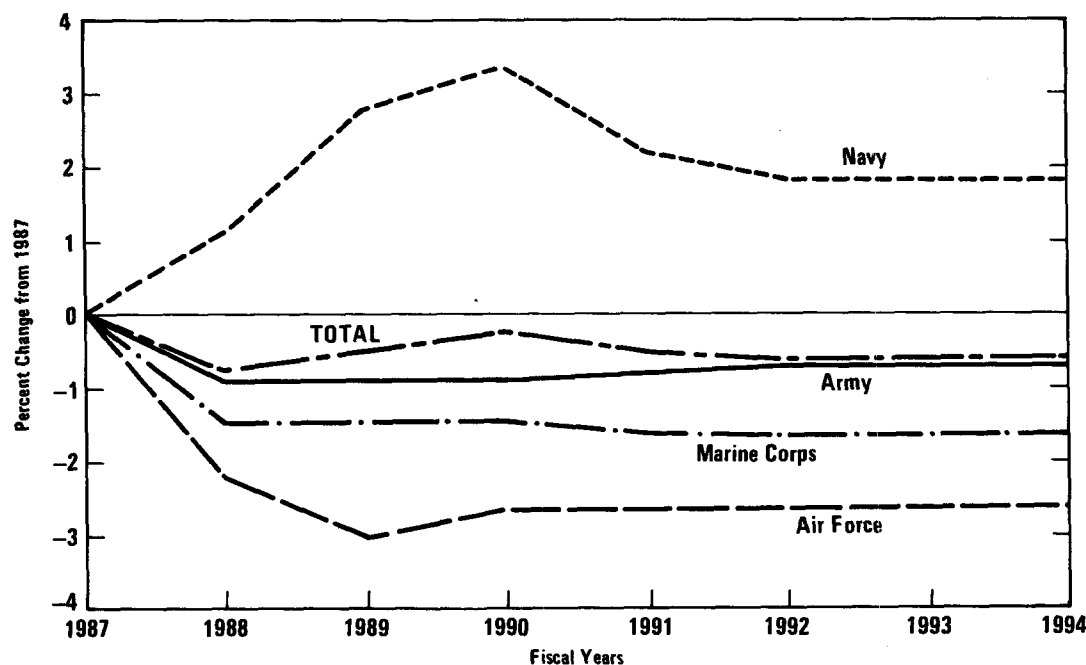
NOTE: Strength levels may not add to totals because of rounding.

Changes also can be assessed against service plans, rather than against the 1987 levels. Navy strength would be 2.1 percent to 4.3 percent below its plan for 1992, Marine Corps strength 1.8 percent to 5.1 percent below its plan. These large reductions reflect the substantial experience gains that this study projects for these two services. Reductions for the Army and Air Force are more modest, leading to total reductions for all services ranging from 1.0 percent to 2.8 percent. This would still amount to a reduction below planned levels of between 18,000 persons (Case 3) and 52,000 (Case 1).

In general, the largest cuts in enlisted strengths under the three alternatives would come in 1988. This is apparent in Figure 8, for Case 2. It reflects the lagged effect of strength changes on aggregate productivity when all of the cuts are made in accessions, as this study assumes they would be (see Chapter II). New recruits add little to total productivity; only after several years do the smaller numbers in the 1988 enlistment cohort have a significant effect--hence the offsetting upturns in Army and Air Force strength levels in 1990.

Figure 8.

Changes in Enlisted Strength Levels from 1987: Case 2



SOURCE: Congressional Budget Office.

Personnel Cost Savings under the Alternatives for Enlisted Strengths

Over the five years 1988 to 1992, the strength cuts under Case 1 would save a total of \$3.6 billion in 1987 dollars relative to costs under the services' strength plans, an average of more than \$700 million per year. Case 2 cuts

TABLE 8. PERSONNEL COSTS, PRESENT AND PROJECTED, WITH ALTERNATIVES UNDER THREE PRODUCTIVITY CASES

	Army	Navy	Marine Corps	Air Force	Total
Personnel Costs (In billions of 1987 dollars)					
1987	17.6	13.9	4.4	13.6	49.5
1992:					
Service Plan	18.3	15.2	4.8	13.9	52.2
Case 1	18.1	14.8	4.6	13.6	51.0
Case 2	18.2	14.9	4.6	13.7	51.4
Case 3	18.2	15.0	4.7	13.8	51.8
Percent Changes					
Relative to 1987:					
Service Plan	3.8	9.6	7.9	2.2	5.3
Case 1	2.6	6.3	3.5	0.2	3.0
Case 2	3.1	7.1	5.0	1.0	3.8
Case 3	3.5	8.2	6.5	1.7	4.6
Relative to 1992 Service Plan:					
Case 1	-1.2	-3.0	-4.1	-2.0	-2.2
Case 2	-0.7	-2.3	-2.7	-1.2	-1.5
Case 3	-0.2	-1.3	-1.3	-0.4	-0.7

SOURCE: Congressional Budget Office.

NOTE: Cost figures may not add to totals because of rounding.